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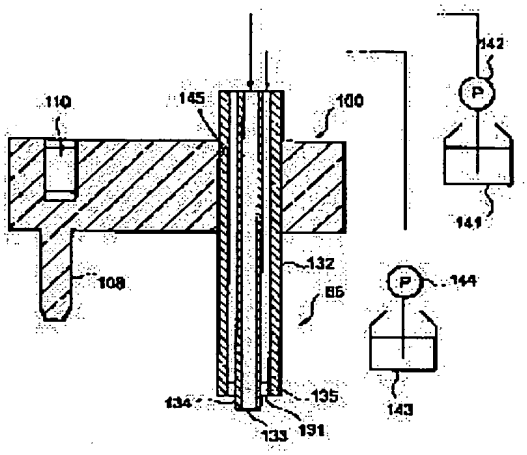
(54) SOLUTION SUPPLY NOZZLE AND SOLUTION SUPPLY APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a solution supply nozzle of which the periphery of the discharge outlet can sufficiently be washed and which can precisely supply a solution to the center of a substrate and to provide a solution supply apparatus.
SOLUTION: A large diameter pipe 132 penetrates a nozzle holding position of a nozzle holding body 100 and a small diameter pipe 134 having a second discharge outlet 133 at the tip for discharging a solution is installed in the large diameter pipe 132. The second discharge outlet 133 of the small diameter pipe 134 is projected out more than a first discharge outlet 131 of the large diameter pipe 132. Three holding members 135 for holding the small diameter pipe 134 at a prescribed position in the inside of the large diameter pipe 132 are installed at the position of the first discharge outlet 131 in the space between the large diameter pipe 132 and the small diameter pipe 134.



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CLAIMS

[Claim(s)]
[Claim 1] A solution supply nozzle characterized by providing a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and in said path.
[Claim 2] A solution supply nozzle which said member is a major-diameter pipe, and said pipe is a minor diameter pipe in a solution supply nozzle according to claim 1, and is characterized by arranging mostly said major-diameter pipe and said minor diameter pipe in the shape of a concentric circle.
[Claim 3] A solution supply nozzle characterized by providing further an attachment component for being arranged in a crevice between said major-diameter pipes and said minor diameter pipes, and holding said minor diameter pipe by position in said major-diameter pipe in a solution supply nozzle according to claim 2.
[Claim 4] A solution supply nozzle characterized by preparing said attachment component in at least three places of a crevice between said major-diameter pipes and said minor diameter pipes in a solution supply nozzle according to claim 3.
[Claim 5] A solution supply nozzle characterized by preparing said attachment component in said 1st delivery in a solution supply nozzle according to claim 3 or 4.
[Claim 6] A solution supply nozzle characterized by preparing said attachment component in one with said major-diameter pipe in a solution supply nozzle according to claim 3, 4, or 5.
[Claim 7] A solution supply nozzle characterized by providing the following. A major-diameter pipe which has at a tip the 1st delivery which carries out the regurgitation of the penetrant remover A minor diameter pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged in said major-diameter pipe The 1st attachment component for being arranged in a crevice between said major-diameter pipes and said minor diameter pipes, and holding said minor diameter pipe by position in said major-diameter pipe The 2nd attachment component which holds said major-diameter pipe at least
[Claim 8] A solution supply nozzle characterized by providing the following. A member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established A pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged at said path An attachment component which holds said member while holding said pipe through a through tube which said pipe penetrates
[Claim 9] A solution feeder characterized by providing the following. A member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established A solution supply nozzle which possesses a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged in said path A penetrant remover feeder style for supplying a penetrant remover to said 1st delivery through said path A solution feeder style for supplying a solution to said 2nd delivery through said pipe
[Claim 10] A solution feeder characterized by providing the following. A maintenance rotation member rotated holding a substrate A member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established A solution supply nozzle which possesses a pipe which has at a tip the

2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged in said path A drain cup for collecting penetrant removers which approached said maintenance rotation member, have been arranged and were breathed out from said 1st delivery of said solution supply nozzle, and a migration device of a substrate held by said maintenance rotation member to which said solution supply nozzle is mostly moved between the center of rotation and said drain cup [Claim 11] A solution feeder characterized by providing further a thinner regurgitation device which carries out the regurgitation of the thinner towards the account aforementioned solution supply nozzle which has been arranged in said drain cup and moved to said drain cup in a solution feeder according to claim 10.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the solution supply nozzle and solution feeder for supplying a solution on substrates, such as a semiconductor wafer.
[0002]
[Description of the Prior Art] In the manufacturing process of a semiconductor device, the interlayer insulation film is formed, for example by the SOD (Spin on Dielectric) system. By the sol-gel method, the silk method, the speed film method, or the Fox method, on a wafer, the spin coat of the spreading film is carried out, chemical preparation or heat-treatment is performed, and the interlayer insulation film is formed in this SOD system.
[0003] For example, in forming an interlayer insulation film by the sol-gel method, it supplies first an insulator layer material, for example, the solution which made the organic solvent distribute the colloid of TEOS (tetra-ethoxy silane), on a semiconductor wafer (it is hereafter called a "wafer".). Next, gelation processing of the wafer with which the solution was supplied is carried out, and, subsequently a solvent is replaced. And the wafer with which the solvent was replaced is heat-treated.
[0004] At the production process which supplies a solution on a wafer among the production processes mentioned above, a spin coat method is used like the technology which applies resist liquid on a wafer, for example. Carry a wafer on a spin chuck and it is made to rotate for example, within a cup, and this spin coat method supplies spreading liquid to the center of rotation of a wafer, and homogeneity is made to extend it all over a wafer from a solution supply nozzle.
[0005] While the solution supply nozzle used with such a spin coat method has the delivery which carries out the regurgitation of the solution for example, towards the wafer surface in the lower limit, the upper limit is grasped by the migration device. Between the center of rotation of the wafer in a cup and the drain cups arranged out of a cup is moved to a solution supply nozzle by this migration device. And the old solution which remains in a solution supply nozzle is made not to be supplied to a wafer because a solution supply nozzle carries out the regurgitation of the solution into a drain cup in advance of supply of the solution to a wafer.
[0006] By the way, after solution supplying a wafer, a solution remains and adheres at the tip of a solution supply nozzle, or there is a possibility that the solution or congelation condensed on the wafer from the solution supply nozzle may be supplied, and spreading unevenness, thickness fluctuation, etc. may occur. Many thin pipes for supplying a penetrant remover are arranged so that the perimeter of a nozzle may be surrounded, and it is washing by supplying a penetrant remover towards the tip of a nozzle from these thin pipes there as indicated by JP,3-21224,Y.
[0007]
[Problem(s) to be Solved by the Invention] However, since each pipe for supplying a penetrant remover is thin even if it is the case where this technology washes a solution supply nozzle, the flow rate of a penetrant remover is inadequate and there is a possibility that washing may not fully be performed. Especially the above-mentioned solution used as a material of the interlayer insulation film in a SOD system has the characteristic technical problem that a solution cannot fall from a nozzle easily compared with resist liquid etc.
[0008] On the other hand, to supply a solution to the center of the wafer which holds and rotates by the spin chuck from a viewpoint of this kind of solution supply nozzle applying a solution to homogeneity, or preventing useless supply of a solution correctly is desired. However, the solution supply nozzle constituted has like **** a possibility that exact positioning cannot be performed from the location

grasped by the migration device of the upper limit serving as criteria, and positioning between a solution supply nozzle and a wafer center being performed.
[0009] The purpose of this invention is to offer the solution supply nozzle and solution feeder which can fully wash near the delivery.
[0010] Another purpose of this invention is to offer the solution supply nozzle and solution feeder which can supply a solution to the center of a substrate correctly.
[0011]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the 1st viewpoint of this invention has the 1st delivery which carries out the regurgitation of the penetrant remover, and possesses a member in which a path for supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged in said path. While the 2nd viewpoint of this invention is arranged in a major-diameter pipe which has at a tip the 1st delivery which carries out the regurgitation of the penetrant remover, and said major-diameter pipe The 1st attachment component for being arranged in a crevice between a minor diameter pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution, said major-diameter pipe, and said minor diameter pipe, and holding said minor diameter pipe by position in said major-diameter pipe from said 1st delivery, The 2nd attachment component which holds said major-diameter pipe at least is provided. While the 3rd viewpoint of this invention is arranged at a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and said path While holding said pipe through a through tube which a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, and said pipe penetrate, an attachment component holding said member is provided. While the 4th viewpoint of this invention is arranged a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and in said path A solution supply nozzle which possesses a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, A penetrant remover feeder style for supplying a penetrant remover to said 1st delivery through said path and a solution feeder style for supplying a solution to said 2nd delivery through said pipe are provided. A maintenance rotation member rotated the 5th viewpoint of this invention holding a substrate, While being arranged a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and in said path A solution supply nozzle which possesses a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, A drain cup for collecting penetrant removers which approached said maintenance rotation member, have been arranged and were breathed out from said 1st delivery of said solution supply nozzle, A migration device of a substrate held by said maintenance rotation member to which said solution supply nozzle is mostly moved between the center of rotation and said drain cup is provided.
[0012] In this invention, since rear-spring-supporter supply is carried out mostly at the perimeter, a penetrant remover breathed out, for example from the 1st delivery of a major-diameter pipe becomes possible [a thing of a minor diameter pipe periphery fully washed near the 2nd delivery of a minor diameter pipe]. Moreover, since it can constitute from this invention so that a minor diameter pipe for carrying out the regurgitation of the solution, for example may be held through an attachment component within a major-diameter pipe, alignment of a minor diameter pipe can be performed on the basis of an attachment component, and a solution can be correctly supplied to a center of a substrate.
[0013]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0014] First, the SOD (Spin on Dielectric) system containing the solution supply nozzle and solution feeder of this invention is explained. Drawing 1 - drawing 3 are drawings showing this whole SOD system configuration, and drawing 1 is [front view and drawing 3 of a plan and drawing 2] rear view.
[0015] This SOD system 1 carries in the semiconductor wafer W to a system from the exterior per two or more sheets, for example, 25 sheets, by the wafer cassette CR as a substrate. Take out from a system or The cassette block 10 for carrying in and taking out the semiconductor wafer W to the wafer

cassette CR, The processing block 11 which comes to carry out multistage arrangement of the various processing stations of single wafer processing which performs one predetermined processing at a time to the semiconductor wafer W in a SOD spreading production process in a predetermined location, It has the configuration which connected to one the cabinet 12 in which the bottle of the aqueous ammonia needed at an aging production process, the bubbler, the drain bottle, etc. were installed.
[0016] In the cassette block 10, as shown in drawing 1 , the wafer cassette CR to four pieces turns each wafer entrance to the location of projection 20a on the cassette installation base 20 at the processing block 11 side, and are laid in the direction single tier of X in it, for example. [two or more] The wafer conveyance object 21 movable in the wafer array direction (Z perpendicular direction) of the wafer contained in the cassette array direction (the direction of X) and the wafer cassette CR accesses each wafer cassette CR alternatively. Furthermore, this wafer conveyance object 21 is constituted pivotable in the direction of theta, and can also access now delivery / cooling plate (TCP) which belongs to the multistage station section of 3rd group G3 by the side of the processing block 11 so that it may mention later.
[0017] In the processing block 11, as shown in drawing 1 , the main wafer conveyance device 22 of a perpendicular conveyance mold is formed in a core, all processing stations cover the surroundings of it at 1 set or two or more groups, and it is arranged in multistage. At this example, it is G1, G2, G3, and G4 4 sets. It is a multistage arrangement configuration and they are the 1st and 2nd groups G1 and G2. It is juxtaposed at a system transverse-plane (it sets to drawing 1 and is this side) side, and a multistage station is 3rd group G3. The cassette block 10 is adjoined, it is arranged and a multistage station is the 4th group G4. A multistage station adjoins a cabinet 12 and is arranged.
[0018] it is shown in drawing 2 -- as -- the 1st group G1 Put Wafer W on a spin chuck within Cup CP, and an insulator layer material is supplied. **** -- The SOD spreading processing station as a solution feeder of this invention which forms a uniform insulator layer on a wafer by rotating a wafer (SCT), Put Wafer W on a spin chuck within Cup CP, and drug solutions for an exchange, such as HMDS and a heptane, are supplied. The solvent exchange processing station (DSE) which performs processing which transposes the solvent in the insulator layer applied on the wafer to other solvents in front of a desiccation production process has put on two steps sequentially from the bottom.
[0019] The 2nd group G2 The SOD spreading processing station (SCT) is arranged on the upper case. In addition, necessity is accepted and it is the 2nd group G2. It is also possible to arrange a SOD spreading processing station (SCT), a solvent exchange processing station (DSE), etc. in the lower berth.
[0020] <A To HREF="/Tokujitu/tjitemdrw.ipdl?N0000=239&N0500=1E_N/;><?
<7=8=///&N0001=425&N0552=9&N0553=000005" TARGET="tjitemdrw"> drawing 3 It is 3rd group G3 so that it may be shown. Then Two hypoxia heating-at-high-temperature processing stations (OHP), A low-temperature heat-treatment station (LHP), two cooling processing stations (CPL), delivery / cooling plates (TCP), and cooling processing stations (CPL) are arranged sequentially from the top in multistage. here -- a hypoxia heating-at-high-temperature processing station (OHP) -- **** -- the hot platen with which Wafer W is laid in the processing interior of a room [-izing / the interior of a room] -- having -- the homogeneity from the hole of the periphery of a hot platen -- N2 It exhausts from the center of the processing room upper part, breathing out, and heating-at-high-temperature processing of the wafer W is carried out in a hypoxia-ized ambient atmosphere. A low-temperature heat-treatment station (LHP) has the hot platen with which Wafer W is laid, and carries out low-temperature heat-treatment of the wafer W. A cooling processing station (CPL) has the cooling plate with which Wafer W is laid, and carries out cooling processing of the wafer W. Delivery / cooling plate (TCP) is made into the cooling plate which cools Wafer W in the lower berth, and the two-step structure of delivering to an upper case and having a base, and delivers Wafer W between the cassette block 10 and the processing block 11.
[0021] the 4th group G4 **** -- a low-temperature heat-treatment station (LHP), two hypoxia cures and cooling processing stations (DCC), and aging processing stations (DAC) are arranged sequentially from the top in multistage. here -- a hypoxia cure and a cooling processing station (DCC) -- **** -- the processing interior of a room [-izing / the interior of a room] is adjoined in a hot platen and a cooling plate -- as -- having -- N2 Cooling processing of the wafer W heat-treated while carrying out heating-at-high-temperature processing in the replaced hypoxia ambient atmosphere is carried out. an aging processing station (DAC) -- **** -- NH3+H2O is introduced into the processing interior of a room [-izing / the interior of a room], aging processing of the wafer W is carried out, and wet gelation of the insulator layer material film on Wafer W is carried out.
[0022] Drawing 4 is the perspective diagram having shown the appearance of the main wafer conveyance

device 22, and this main wafer conveyance device 22 has equipped the wafer transport device 30 which can go up and down freely in the vertical direction (Z direction) inside the tubed base material 27 which consists of walls 25 and 26 of the pair which is connected mutually and counters in upper limit and a lower limit. It connects with the axis of rotation of a motor 31, and the tubed base material 27 rotates to the wafer transport device 30 and one centering on said axis of rotation with the rotation driving force of this motor 31. Therefore, the wafer transport device 30 can be freely rotated in the direction of theta. On the conveyance pedestal 40 of this wafer transport device 30, it has three pincettes, for example. These pincettes 41, 42, and 43 all have the gestalt and magnitude which can pass both the walls 25 of the tubed base material 27, and the side opening 44 between 26 freely, and they are constituted so that order migration may be attained along the direction of X. And the main wafer conveyance device 22 accesses pincettes 41, 42, and 43 at the processing station arranged to the perimeter, and delivers Wafer W between these processing stations.

[0023] The abbreviation cross section and drawing 6 which show the whole SOD spreading processing station (SCT) configuration which drawing 5 requires for this invention mentioned above are the schematic plan view.

[0024] At this SOD spreading processing station (SCT), the annular cup CP is arranged in the center section of a unit bottom, and the spin chuck 52 is arranged at that inside. A spin chuck 52 is in the condition which carried out fixed maintenance of the wafer W by vacuum adsorption, and it is constituted so that it may rotate with the rotation driving force of a drive motor 54. the cylinder to which the drive motor 54 abbreviated illustration -- rise and fall -- it is arranged movable and, thereby, rise and fall of a spin chuck 52 are enabled. Moreover, as for the inside of Cup CP, the drain port 55 for waste fluid and the drain port 56 for exhaust air are formed separately.

[0025] The solution supply nozzle 86 for supplying the insulator layer material as a solution to the wafer surface of Wafer W is connected to the solution feed zone (not shown) through the solution supply pipe 88. The solution supply nozzle 86 is attached in the point of the nozzle scan arm 92 removable in the nozzle standby section 90 arranged in the outside of Cup CP, and is transported to the predetermined solution liquid regurgitation location set up above the spin chuck 52. The nozzle scan arm 92 is attached on the guide rail 94 laid by the one direction (the direction of Y) on the unit bottom plate 50 at the upper limit section of the perpendicular supporter material 96 in which horizontal migration is possible, and moves to the perpendicular supporter material 96 and one in the direction of Y with the direction drive of Y which is not illustrated.

[0026] The nozzle scan arm 92 is movable also in the direction of Y, and the right-angled direction of X, in order to attach the solution supply nozzle 86 alternatively in the nozzle standby section 90, and it moves also in the direction of X with the direction drive of X which is not illustrated.

[0027] Moreover, the solution at the tip of a nozzle solidifies or deteriorates by the delivery of the solution supply nozzle 86 being inserted in opening 90a of a solvent ambient atmosphere room in the nozzle standby section 90, and being exposed to the ambient atmosphere of a solvent in inside. Moreover, two or more solution supply nozzles 86 and 86 and -- are prepared, and those nozzles are properly used according to the class of solution.

[0028] Furthermore, the drain cup 130 is formed between Cup CP and the nozzle standby section 90, and washing of the solution supply nozzle 86 is performed in advance of supply of the solution to Wafer W in this location. In addition, about this washing, it mentions later.

[0029] On the guide rail 94, not only the perpendicular supporter material 96 that supports the above-mentioned nozzle scan arm 92 but the rinse nozzle scan arm 120 is supported, and the movable perpendicular supporter material 122 is also formed in the direction of Y. The rinse nozzle 124 for side rinses is attached in the point of the rinse nozzle scan arm 120. The rinse nozzle scan arm 120 and the rinse nozzle 124 advance side by side or move [straight line] with the direction drive (not shown) of Y between the nozzle position in readiness (location of a continuous line) set as the side of Cup CP, and the rinse regurgitation location (location of a dotted line) set up right above the periphery section of the wafer W currently laid in the spin chuck 52. And after supplying an insulator layer material on Wafer W from the solution supply nozzle 86, a solvent is supplied to a wafer W surface periphery by this rinse nozzle 124, and the insulator layer material of this portion is dissolved and removed. Thereby, while conveying Wafer W by the conveyance system, the insulator layer of Wafer W can contact somewhere and an insulator layer can prevent separating and carrying out raising dust.

[0030] In addition, in drawing 5 , in order to make an illustration easy, piping connected to the solution supply nozzle 86 and the rinse nozzle 124, respectively is excluded from drawing. Moreover, in drawing 5

and drawing 6 , the shutter attached in the opening DR for pincettes 41-43 to frequent a station is excluded from drawing.

[0031] Next, it explains in more detail about the solution supply nozzle 86 concerning this invention mentioned above.

[0032] Drawing 7 is the cross section showing the configuration of the nozzle supporter 100 which is a part of migration device holding the solution supply nozzle 86 and this. Drawing 8 is drawing which looked at the solution supply nozzle 86 from the lower part. The holddown member 108 of the shape of a rod to carry out fitting immobilization protrudes on maintenance hole 90b for immobilization of the resist nozzle standby section 90 on one inferior surface of tongue of the nozzle supporter 100, and the crevice 110 for receiving the pincette (illustration being omitted) of the nozzle scan arm 92 is established in the upper surface of this holddown member 108 and the opposite side.

[0033] Moreover, the nozzle supporter 100 holds the solution supply nozzle 86 in the location in which the holddown member 108 and the crevice 110 were established, and the location of the opposite side. This solution supply nozzle 86 has the major-diameter pipe 132 which has at a tip the 1st delivery 131 which carries out the regurgitation of the penetrant removers, such as pure. The major-diameter pipe 132 has penetrated the nozzle maintenance hole 145 of the nozzle supporter

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TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to the solution supply nozzle and solution feeder for supplying a solution on substrates, such as a semiconductor wafer.

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PRIOR ART

[Description of the Prior Art] In the manufacturing process of a semiconductor device, the interlayer insulation film is formed, for example by the SOD (Spin on Dielectric) system. By the sol-gel method, the silk method, the speed film method, or the Fox method, on a wafer, the spin coat of the spreading film is carried out, chemical preparation or heat-treatment is performed, and the interlayer insulation film is formed in this SOD system.
[0003] For example, in forming an interlayer insulation film by the sol-gel method, it supplies first an insulator layer material, for example, the solution which made the organic solvent distribute the colloid of TEOS (tetra-ethoxy silane), on a semiconductor wafer (it is hereafter called a "wafer".). Next, gelation processing of the wafer with which the solution was supplied is carried out, and, subsequently a solvent is replaced. And the wafer with which the solvent was replaced is heat-treated.
[0004] At the production process which supplies a solution on a wafer among the production processes mentioned above, a spin coat method is used like the technology which applies resist liquid on a wafer, for example. Carry a wafer on a spin chuck and it is made to rotate for example, within a cup, and this spin coat method supplies spreading liquid to the center of rotation of a wafer, and homogeneity is made to extend it all over a wafer from a solution supply nozzle.
[0005] While the solution supply nozzle used with such a spin coat method has the delivery which carries out the regurgitation of the solution for example, towards the wafer surface in the lower limit, the upper limit is grasped by the migration device. Between the center of rotation of the wafer in a cup and the drain cups arranged out of a cup is moved to a solution supply nozzle by this migration device. And the old solution which remains in a solution supply nozzle is made not to be supplied to a wafer because a solution supply nozzle carries out the regurgitation of the solution into a drain cup in advance of supply of the solution to a wafer.
[0006] By the way, after solution supplying a wafer, a solution remains and adheres at the tip of a solution supply nozzle, or there is a possibility that the solution or congelation condensed on the wafer from the solution supply nozzle may be supplied, and spreading unevenness, thickness fluctuation, etc. may occur. Many thin pipes for supplying a penetrant remover are arranged so that the perimeter of a nozzle may be surrounded, and it is washing by supplying a penetrant remover towards the tip of a nozzle from these thin pipes there as indicated by JP,3-21224,Y.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, it can fully wash near the delivery. Moreover, a solution can be correctly supplied to the center of a substrate.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since each pipe for supplying a penetrant remover is thin even if it is the case where this technology washes a solution supply nozzle, the flow rate of a penetrant remover is inadequate and there is a possibility that washing may not fully be performed. Especially the above-mentioned solution used as a material of the interlayer insulation film in a SOD system has the characteristic technical problem that a solution cannot fall from a nozzle easily compared with resist liquid etc.
[0008] On the other hand, to supply a solution to the center of the wafer which holds and rotates by the spin chuck from a viewpoint of this kind of solution supply nozzle applying a solution to homogeneity, or preventing useless supply of a solution correctly is desired. However, the solution supply nozzle constituted has like **** a possibility that exact positioning cannot be performed from the location grasped by the migration device of the upper limit serving as criteria, and positioning between a solution supply nozzle and a wafer center being performed.
[0009] The purpose of this invention is to offer the solution supply nozzle and solution feeder which can fully wash near the delivery.
[0010] Another purpose of this invention is to offer the solution supply nozzle and solution feeder which can supply a solution to the center of a substrate correctly.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the 1st viewpoint of this invention has the 1st delivery which carries out the regurgitation of the penetrant remover, and possesses a member in which a path for supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery while being arranged in said path. While the 2nd viewpoint of this invention is arranged in a major-diameter pipe which has at a tip the 1st delivery which carries out the regurgitation of the penetrant remover, and said major-diameter pipe The 1st attachment component for being arranged in a crevice between a minor diameter pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution, said major-diameter pipe, and said minor diameter pipe, and holding said minor diameter pipe by position in said major-diameter pipe from said 1st delivery, The 2nd attachment component which holds said major-diameter pipe at least is provided. While the 3rd viewpoint of this invention is arranged at a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and said path While holding said pipe through a through tube which a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, and said pipe penetrate, an attachment component holding said member is provided. While the 4th viewpoint of this invention is arranged a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and in said path A solution supply nozzle which possesses a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, A penetrant remover feeder style for supplying a penetrant remover to said 1st delivery through said path and a solution feeder style for supplying a solution to said 2nd delivery through said pipe are provided. A maintenance rotation member rotated the 5th viewpoint of this invention holding a substrate, While being arranged a member in which a path for having the 1st delivery which carries out the regurgitation of the penetrant remover, and supplying a penetrant remover to said 1st delivery through said 1st delivery was established, and in said path A solution supply nozzle which possesses a pipe which has at a tip the 2nd delivery which carries out the regurgitation of a projection and the solution from said 1st delivery, A drain cup for collecting penetrant removers which approached said maintenance rotation member, have been arranged and were breathed out from said 1st delivery of said solution supply nozzle, A migration device of a substrate held by said maintenance rotation member to which said solution supply nozzle is mostly moved between the center of rotation and said drain cup is provided.

[0012] In this invention, since rear-spring-supporter supply is carried out mostly at the perimeter, a penetrant remover breathed out, for example from the 1st delivery of a major-diameter pipe becomes possible [a thing of a minor diameter pipe periphery fully washed near the 2nd delivery of a minor diameter pipe]. Moreover, since it can constitute from this invention so that a minor diameter pipe for carrying out the regurgitation of the solution, for example may be held through an attachment component within a major-diameter pipe, alignment of a minor diameter pipe can be performed on the basis of an attachment component, and a solution can be correctly supplied to a center of a substrate.

[0013]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

[0014] First, the SOD (Spin on Dielectric) system containing the solution supply nozzle and solution

feeder of this invention is explained. Drawing 1 - drawing 3 are drawings showing this whole SOD system configuration, and drawing 1 is [front view and drawing 3 of a plan and drawing 2] rear view.
[0015] This SOD system 1 carries in the semiconductor wafer W to a system from the exterior per two or more sheets, for example, 25 sheets, by the wafer cassette CR as a substrate. Take out from a system or The cassette block 10 for carrying in and taking out the semiconductor wafer W to the wafer cassette CR, The processing block 11 which comes to carry out multistage arrangement of the various processing stations of single wafer processing which performs one predetermined processing at a time to the semiconductor wafer W in a SOD spreading production process in a predetermined location, It has the configuration which connected to one the cabinet 12 in which the bottle of the aqueous ammonia needed at an aging production process, the bubbler, the drain bottle, etc. were installed.
[0016] In the cassette block 10, as shown in drawing 1 , the wafer cassette CR to four pieces turns each wafer entrance to the location of projection 20a on the cassette installation base 20 at the processing block 11 side, and are laid in the direction single tier of X in it, for example. [two or more] The wafer conveyance object 21 movable in the wafer array direction (Z perpendicular direction) of the wafer contained in the cassette array direction (the direction of X) and the wafer cassette CR accesses each wafer cassette CR alternatively. Furthermore, this wafer conveyance object 21 is constituted pivotable in the direction of theta, and can also access now delivery / cooling plate (TCP) which belongs to the multistage station section of 3rd group G3 by the side of the processing block 11 so that it may mention later.
[0017] In the processing block 11, as shown in drawing 1 , the main wafer conveyance device 22 of a perpendicular conveyance mold is formed in a core, all processing stations cover the surroundings of it at 1 set or two or more groups, and it is arranged in multistage. At this example, it is G1, G2, G3, and G4 4 sets. It is a multistage arrangement configuration and they are the 1st and 2nd groups G1 and G2. It is juxtaposed at a system transverse-plane (it sets to drawing 1 and is this side) side, and a multistage station is 3rd group G3. The cassette block 10 is adjoined, it is arranged and a multistage station is the 4th group G4. A multistage station adjoins a cabinet 12 and is arranged.
[0018] it is shown in drawing 2 -- as -- the 1st group G1 Put Wafer W on a spin chuck within Cup CP, and an insulator layer material is supplied. **** -- The SOD spreading processing station as a solution feeder of this invention which forms a uniform insulator layer on a wafer by rotating a wafer (SCT), Put Wafer W on a spin chuck within Cup CP, and drug solutions for an exchange, such as HMDS and a heptane, are supplied. The solvent exchange processing station (DSE) which performs processing which transposes the solvent in the insulator layer applied on the wafer to other solvents in front of a desiccation production process has put on two steps sequentially from the bottom.
[0019] The 2nd group G2 The SOD spreading processing station (SCT) is arranged on the upper case. In addition, necessity is accepted and it is the 2nd group G2. It is also possible to arrange a SOD spreading processing station (SCT), a solvent exchange processing station (DSE), etc. in the lower berth.
[0020] it is shown in drawing 3 -- as -- 3rd group G3 **** -- two hypoxia heating-at-high-temperature processing stations (OHP), low-temperature heat-treatment stations (LHP), two cooling processing stations (CPL), delivery / cooling plates (TCP), and cooling processing stations (CPL) are arranged sequentially from the top in multistage. here -- a hypoxia heating-at-high-temperature processing station (OHP) -- **** -- the hot platen with which Wafer W is laid in the processing interior of a room [-izing / the interior of a room] -- having -- the homogeneity from the hole of the periphery of a hot platen -- N2 It exhausts from the center of the processing room upper part, breathing out, and heating-at-high-temperature processing of the wafer W is carried out in a hypoxia-ized ambient atmosphere. A low-temperature heat-treatment station (LHP) has the hot platen with which Wafer W is laid, and carries out low-temperature heat-treatment of the wafer W. A cooling processing station (CPL) has the cooling plate with which Wafer W is laid, and carries out cooling processing of the wafer W. Delivery / cooling plate (TCP) is made into the cooling plate which cools Wafer W in the lower berth, and the two-step structure of delivering to an upper case and having a base, and delivers Wafer W between the cassette block 10 and the processing block 11.
[0021] the 4th group G4 **** -- a low-temperature heat-treatment station (LHP), two hypoxia cures and cooling processing stations (DCC), and aging processing stations (DAC) are arranged sequentially from the top in multistage. here -- a hypoxia cure and a cooling processing station (DCC) -- **** -- the processing interior of a room [-izing / the interior of a room] is adjoined in a hot platen and a cooling plate -- as -- having -- N2 Cooling processing of the wafer W heat-treated while carrying out heating-at-high-temperature processing in the replaced hypoxia ambient atmosphere is carried out. an

aging processing station (DAC) -- **** -- NH3+H2O is introduced into the processing interior of a room [-izing / the interior of a room], aging processing of the wafer W is carried out, and wet gelation of the insulator layer material film on Wafer W is carried out.

[0022] Drawing 4 is the perspective diagram having shown the appearance of the main wafer conveyance device 22, and this main wafer conveyance device 22 has equipped the wafer transport device 30 which can go up and down freely in the vertical direction (Z direction) inside the tubed base material 27 which consists of walls 25 and 26 of the pair which is connected mutually and counters in upper limit and a lower limit. It connects with the axis of rotation of a motor 31, and the tubed base material 27 rotates to the wafer transport device 30 and one centering on said axis of rotation with the rotation driving force of this motor 31. Therefore, the wafer transport device 30 can be freely rotated in the direction of theta. On the conveyance pedestal 40 of this wafer transport device 30, it has three pincettes, for example. These pincettes 41, 42, and 43 all have the gestalt and magnitude which can pass both the walls 25 of the tubed base material 27, and the side opening 44 between 26 freely, and they are constituted so that order migration may be attained along the direction of X. And the main wafer conveyance device 22 accesses pincettes 41, 42, and 43 at the processing station arranged to the perimeter, and delivers Wafer W between these processing stations.

[0023] The abbreviation cross section and drawing 6 which show the whole SOD spreading processing station (SCT) configuration which drawing 5 requires for this invention mentioned above are the schematic plan view.

[0024] At this SOD spreading processing station (SCT), the annular cup CP is arranged in the center section of a unit bottom, and the spin chuck 52 is arranged at that inside. A spin chuck 52 is in the condition which carried out fixed maintenance of the wafer W by vacuum adsorption, and it is constituted so that it may rotate with the rotation driving force of a drive motor 54. the cylinder to which the drive motor 54 abbreviated illustration -- rise and fall -- it is arranged movable and, thereby, rise and fall of a spin chuck 52 are enabled. Moreover, as for the inside of Cup CP, the drain port 55 for waste fluid and the drain port 56 for exhaust air are formed separately.

[0025] The solution supply nozzle 86 for supplying the insulator layer material as a solution to the wafer surface of Wafer W is connected to the solution feed zone (not shown) through the solution supply pipe 88. The solution supply nozzle 86 is attached in the point of the nozzle scan arm 92 removable in the nozzle standby section 90 arranged in the outside of Cup CP, and is transported to the predetermined solution liquid regurgitation location set up above the spin chuck 52. The nozzle scan arm 92 is attached on the guide rail 94 laid by the one direction (the direction of Y) on the unit bottom plate 50 at the upper limit section of the perpendicular supporter material 96 in which horizontal migration is possible, and moves to the perpendicular supporter material 96 and one in the direction of Y with the direction drive of Y which is not illustrated.

[0026] The nozzle scan arm 92 is movable also in the direction of Y, and the right-angled direction of X, in order to attach the solution supply nozzle 86 alternatively in the nozzle standby section 90, and it moves also in the direction of X with the direction drive of X which is not illustrated.

[0027] Moreover, the solution at the tip of a nozzle solidifies or deteriorates by the delivery of the solution supply nozzle 86 being inserted in opening 90a of a solvent ambient atmosphere room in the nozzle standby section 90, and being exposed to the ambient atmosphere of a solvent in inside. Moreover, two or more solution supply nozzles 86 and 86 and -- are prepared, and those nozzles are properly used according to the class of solution.

[0028] Furthermore, the drain cup 130 is formed between Cup CP and the nozzle standby section 90, and washing of the solution supply nozzle 86 is performed in advance of supply of the solution to Wafer W in this location. In addition, about this washing, it mentions later.

[0029] On the guide rail 94, not only the perpendicular supporter material 96 that supports the above-mentioned nozzle scan arm 92 but the rinse nozzle scan arm 120 is supported, and the movable perpendicular supporter material 122 is also formed in the direction of Y. The rinse nozzle 124 for side rinses is attached in the point of the rinse nozzle scan arm 120. The rinse nozzle scan arm 120 and the rinse nozzle 124 advance side by side or move [straight line] with the direction drive (not shown) of Y between the nozzle position in readiness (location of a continuous line) set as the side of Cup CP, and the rinse regurgitation location (location of a dotted line) set up right above the periphery section of the wafer W currently laid in the spin chuck 52. And after supplying an insulator layer material on Wafer W from the solution supply nozzle 86, a solvent is supplied to a wafer W surface periphery by this rinse nozzle 124, and the insulator layer material of this portion is dissolved and removed. Thereby, while

conveying Wafer W by the conveyance system, the insulator layer of Wafer W can contact somewhere and an insulator layer can prevent separating and carrying out raising dust.
[0030] In addition, in drawing 5 , in order to make an illustration easy, piping connected to the solution supply nozzle 86 and the rinse nozzle 124, respectively is excluded from drawing. Moreover, in drawing 5 and drawing 6 , the shutter attached in the opening DR for pincettes 41-43 to frequent a station is excluded from drawing.
[0031] Next, it explains in more detail about the solution supply nozzle 86 concerning this invention mentioned above.
[0032] Drawing 7 is the cross section showing the configuration of the nozzle supporter 100 which is a part of migration device holding the solution supply nozzle 86 and this. Drawing 8 is drawing which looked at the solution supply nozzle 86 from the lower part. The holddown member 108 of the shape of a rod to carry out fitting immobilization protrudes on maintenance hole 90b for immobilization of the resist nozzle standby section 90 on one inferior surface of tongue of the nozzle supporter 100, and the crevice 110 for receiving the pincette (illustration being omitted) of the nozzle scan arm 92 is established in the upper surface of this holddown member 108 and the opposite side.
[0033] Moreover, the nozzle supporter 100 holds the solution supply nozzle 86 in the location in which the holddown member 108 and the crevice 110 were established, and the location of the opposite side. This solution supply nozzle 86 has the major-diameter pipe 132 which has at a tip the 1st delivery 131 which carries out the regurgitation of the penetrant removers, such as pure. The major-diameter pipe 132 has penetrated the nozzle maintenance hole 145 of the nozzle supporter 100, and the minor diameter pipe 134 which has at a tip the 2nd delivery 133 which carries out the regurgitation of the insulator layer material as a solution is arranged in this major-diameter pipe 132. The 2nd delivery 133 of this minor diameter pipe 134 is projected from the 1st delivery 131 of the major-diameter pipe 132. An insulating material is supplied to the minor diameter pipe 134 from the tank 141 by which the insulator layer material was accumulated through the pump 142. Moreover, a penetrant remover is supplied to the major-diameter pipe 132 from the tank 143 by which the penetrant remover was accumulated through the pump 144.
[0034] Moreover, it is a crevice between the major-diameter pipe 132 and the minor diameter pipe 134, and three of two or more attachment components 135 for holding the minor diameter pipe 134 by the position in the major-diameter pipe 132 are prepared in the location of the 1st delivery 131, for example. It comes to be able to carry out the alignment of the minor diameter pipe 134 in the direction of X-Y by the attachment component 135 by making an attachment component 135 or more into three. Moreover, although an attachment component 135 may be constituted in one with the major-diameter pipe 132 and the minor diameter pipe 134, it is constituting so that it may become the minor diameter pipe 134 and another object while constituting it in one with the major-diameter pipe 132, and becomes easy [the alignment of the minor diameter pipe 134]. This becomes possible from the minor diameter pipe 134 to supply a solution to the center of rotation of Wafer W correctly. In addition, a screw member constitutes an attachment component 135, and if it is made to perform alignment of the minor diameter pipe 134 by rotating an attachment component 135, alignment can carry out easily.
[0035] Next, the actuation in the SOD system 1 constituted in this way is explained. Drawing 9 shows the processing flow in this SOD system 1.
[0036] In the cassette block 10, the wafer W before processing is conveyed to the delivery base in delivery / cooling plate (TCP) which belongs to 3rd group G3 by the side of the processing block 11 through the wafer conveyance object 21 from the wafer cassette CR first.
[0037] The wafer W conveyed on the delivery base in delivery / cooling plate (TCP) is conveyed through the main wafer conveyance device 22 at a cooling processing station (CPL). And at a cooling processing station (CPL), Wafer W is cooled to the temperature which suits the processing in a SOD spreading processing station (SCT) (step 901).
[0038] The wafer W by which cooling processing was carried out is conveyed through the main wafer conveyance device 22 at a SOD spreading processing station (SCT) at a cooling processing station (CPL). And as for Wafer W, SOD spreading processing is performed at a SOD spreading processing station (SCT) (step 902). This is located on the drain cup 130, as the solution supply nozzle 86 shows a SOD spreading processing station (SCT) to drawing 10 , and as shown in drawing 11 in this condition, it carries out the regurgitation of the insulator layer material towards the drain cup 130 from the 2nd delivery 133 of the minor diameter pipe 134. The old insulator layer material which remains in the minor diameter pipe 134 is made to breathe out by this, and it becomes possible to supply a fresh insulator

layer material from the 2nd delivery 133 of the minor diameter pipe 134. Next, a penetrant remover is made to breathe out from the 1st delivery 131 of the major-diameter pipe 132, as shown in drawing 12 . The breathed-out penetrant remover hangs down the minor diameter pipe 134 surface to the propagation drain cup 130, and falls. Thereby, the old insulator layer material which remained and adhered to the 2nd about 133 delivery of the minor diameter pipe 134 of the solution supply nozzle 86 is washed. After washing, the solution supply nozzle 86 is conveyed at the center of the wafer which holds and rotates by the spin chuck 52, and starts supply of an insulator layer material. And after supplying an insulator layer material on Wafer W from the solution supply nozzle 86, a solvent is supplied to a wafer W surface periphery by this rinse nozzle 124, and the insulator layer material of this portion is dissolved and removed.

[0039] The wafer W with which SOD spreading processing was performed is conveyed through the main wafer conveyance device 22 at an aging processing station (DAC) at a SOD spreading processing station (SCT). And at an aging processing station (DAC), Wafer W introduces NH3+H2O into the processing interior of a room, carries out aging processing of the wafer W, and gels the insulator layer material film on Wafer W (step 903).

[0040] The wafer W by which aging processing was carried out is conveyed through the main wafer conveyance device 22 at a solvent exchange processing station (DSE) at an aging processing station (DAC). And at a solvent exchange processing station (DSE), processing with which, as for Wafer W, the drug solution for an exchange replaces the solvent in the insulator layer which was supplied and was applied on the wafer to other solvents is performed (step 904).

[0041] The wafer W with which substitute processing was performed is conveyed through the main wafer conveyance device 22 at a low-temperature heat-treatment station (LHP) at a solvent exchange processing station (DSE). And at a low-temperature heat-treatment station (LHP), low-temperature heat-treatment of the wafer W is carried out (step 905).

[0042] The wafer W by which low-temperature heat-treatment was carried out is conveyed through the main wafer conveyance device 22 at a hypoxia heating-at-high-temperature processing station (OHP) at a low-temperature heat-treatment station (LHP). And at a hypoxia heating-at-high-temperature processing station (OHP), as for Wafer W, heating-at-high-temperature processing in a hypoxia-ized ambient atmosphere is performed (step 906).

[0043] The wafer W with which heating-at-high-temperature processing was performed is conveyed through the main wafer conveyance device 22 at a hypoxia cure and a cooling processing station (DCC) at a hypoxia heating-at-high-temperature processing station (OHP). And at a hypoxia cure and a cooling processing station (DCC), in a hypoxia ambient atmosphere, heating-at-high-temperature processing is carried out, and cooling processing of the wafer W is carried out (step 907).

[0044] The wafer W processed at the hypoxia cure and the cooling processing station (DCC) is conveyed through the main wafer conveyance device 22 to the cooling plate in delivery / cooling plate (TCP). And cooling processing of the wafer W is carried out in the cooling plate in delivery / cooling plate (TCP) (step 908).

[0045] The wafer W by which cooling processing was carried out with the cooling plate in delivery / cooling plate (TCP) is conveyed through the wafer conveyance object 21 to the wafer cassette CR in the cassette block 10.

[0046] Thus, in the SOD system 1 of this operation gestalt, since the solution supply nozzle 86 which can perform alignment of a regurgitation location correctly at a SOD spreading processing station (SCT) is used, the insulator layer material which is a solution correctly can be supplied to the center of rotation of Wafer W. Therefore, a solution can be supplied to homogeneity that there is no futility on Wafer W. Moreover, since the solution washing nozzle 86 can fully be washed, after solution supplying Wafer W, a solution remains and adheres at the tip of the solution supply nozzle 86, or it is lost that the solution or congelation condensed on Wafer W from the solution supply nozzle 86 is supplied, and spreading unevenness, thickness fluctuation, etc. occur.

[0047] In addition, at the SOD spreading processing station (SCT) mentioned above, as show, for example in drawing 13 , two or more steps of slide type cylinder electric shielding members 140 be form in the upper ceiling section of Cup CP, and if it constitute so that a closed space (refer to drawing middle point line) may be form between the cylinder electric shielding member 140 and Cup CP at the time of SOD spreading, diffusion of Myst can be prevent.

[0048] Moreover, as shown, for example in drawing 14 , in order to carry out rinse washing of the inside of Cup CP, the rinse supply pipe 141 is connected inside Cup CP, and you may make it supply a rinse

inside Cup CP through the rinse supply pipe 141 at the SOD spreading processing station (SCT) mentioned above from the rinse feeder which omitted illustration. In that case, as it indicates drawing 15 that the leakage of a rinse is not produced in a part for the connection of the rinse supply pipe 141 and Cup CP, while inserting O ring 142 in a part for the connection of the rinse supply pipe 141 and Cup CP, you may constitute so that the rinses which connected the drain pipe 143 to the lower part for a connection with the rinse supply pipe 141 of Cup CP, and leaked through the drain pipe 143 may be collected. Here, the double pipe structure which made the rinse supply pipe 141 and the drain pipe 143 in one is shown. Moreover, if it constitutes so that Cup CP may recover the rinse collected by the drain pipe 143, the special structure for recovery will become unnecessary. In order to report having produced leakage furthermore, a leak sensor may be formed in a drain pipe 143 etc. Detection of leakage of a rinse can be ensured by forming a leak sensor in a drain pipe 143.

[0049] Next, other operation gestalten of this invention are explained.

[0050] Drawing 16 is the cross section showing the configuration of the nozzle supporter which is a part of migration device holding the solution supply nozzle and this in this operation gestalt. Drawing 17 is drawing which looked at this solution supply nozzle from the lower part. The holddown member 202 of the shape of a rod to carry out fitting immobilization protrudes on maintenance hole 90b for immobilization of the resist nozzle standby section 90 shown in drawing 6 like the operation gestalt mentioned above on one inferior surface of tongue of the nozzle supporter 201, and the crevice 203 for receiving the pincette (illustration being omitted) of the nozzle scan arm 92 is established in the upper surface of this holddown member 202 and the opposite side.

[0051] Moreover, the nozzle supporter 201 holds the solution supply nozzle 204 in the location in which the holddown member 202 and the crevice 203 were established, and the location of the opposite side. This solution supply nozzle 204 has the 1st delivery 205 which carries out the regurgitation of the penetrant remover, and has the member 207 in which the path 206 for supplying a penetrant remover to this 1st delivery 205 through this 1st delivery 205 was established, and the pipe 209 which has at a tip the 2nd delivery 208 which carries out the regurgitation of the insulating material which are a projection and a solution from the 1st delivery 205 while being arranged at a path 206. And the nozzle supporter 201 holds the member 207 while holding a pipe 209 through the through tube 210 which a pipe 209 penetrates. An insulating material is supplied to a pipe 209 from the tank 212 by which the insulator layer material was accumulated through the pump 211. Moreover, a penetrant remover is supplied to a path 206 from the tank 214 by which the penetrant remover was accumulated through the pump 213. Especially with this operation gestalt, supply of the penetrant remover to a path 206 is performed from the side of a member 207, and supply of the insulating material to a pipe 209 is performed from the upper part.

[0052] Especially with this operation gestalt, it can go across a penetrant remover all over a pipe 209, can supply uniformly, and, thereby, can wash uniformly to homogeneity.

[0053] Drawing 18 is drawing showing the configuration of the drain cup in still more nearly another operation gestalt of this invention.

[0054] With this operation gestalt, the discharge tube 221 which carries out the regurgitation of the thinner is formed in the drain cup 130, and thinner is supplied to this discharge tube 221 from the tank 223 by which thinner was accumulated through the pump 222. And like the case where it is first shown in drawing 12 , after washing the periphery tip of the minor diameter pipe 134 by the penetrant remover (drawing 18 (A)), thinner is breathed out from a discharge tube 221 towards the periphery tip of the minor diameter pipe 134, and washing by thinner is performed (drawing 18 (B)). This invention is not limited to the gestalt of operation mentioned above, but is variously deformable. For example, the substrates to process may be other things, such as not only a semiconductor wafer but a LCD substrate. Moreover, a membranous class is not restricted to an interlayer insulation film.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the plan of the SOD system concerning the gestalt of operation of this invention.
[Drawing 2] It is the front view of the SOD system shown in drawing 1 .
[Drawing 3] It is the rear view of the SOD system shown in drawing 1 .
[Drawing 4] It is the perspective diagram of the main wafer conveyance device in the SOD system shown in drawing 1 .
[Drawing 5] It is the cross section showing the whole SOD spreading processing station configuration concerning the gestalt of operation of this invention.
[Drawing 6] It is the plan of the SOD spreading processing station shown in drawing 5 .
[Drawing 7] It is the cross section showing the configuration of the nozzle supporter holding the solution supply nozzle and this concerning the gestalt of operation of this invention.
[Drawing 8] It is drawing which looked at the solution supply nozzle shown in drawing 7 from the lower part.
[Drawing 9] It is processing flow drawing of the SOD system shown in drawing 1 .
[Drawing 10] It is explanatory drawing (the 1) of operation in the solution supply nozzle concerning the gestalt of operation of this invention.
[Drawing 11] It is explanatory drawing (the 2) of operation in the solution supply nozzle concerning the gestalt of operation of this invention.
[Drawing 12] It is explanatory drawing (the 3) of operation in the solution supply nozzle concerning the gestalt of operation of this invention.
[Drawing 13] It is the cross section showing the whole SOD spreading processing station configuration concerning the gestalt of other operations of this invention.
[Drawing 14] the configuration of the SOD spreading processing station concerning the gestalt of other operations of this invention is shown -- it is a cross section a part.
[Drawing 15] the configuration of the SOD spreading processing station concerning the gestalt of other operations of this invention is shown -- it is a cross section a part.
[Drawing 16] It is the cross section showing the configuration of the nozzle supporter holding the solution supply nozzle and this concerning the gestalt of other operations of this invention.
[Drawing 17] It is drawing which looked at the solution supply nozzle shown in drawing 16 from the lower part.
[Drawing 18] It is drawing for explaining the configuration of the drain concerning still more nearly another operation gestalt of this invention.
[Description of Notations]
86 Solution Supply Nozzle
100 Nozzle Supporter
130 Drain Cup
131 1st Delivery
132 Major-Diameter Pipe
133 2nd Delivery
134 Minor Diameter Pipe
135 Attachment Component
SCT SOD spreading processing station

[Translation done.]

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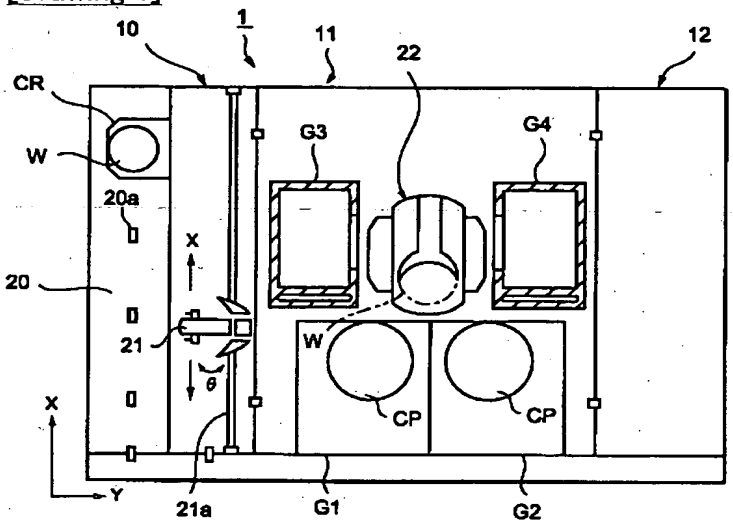
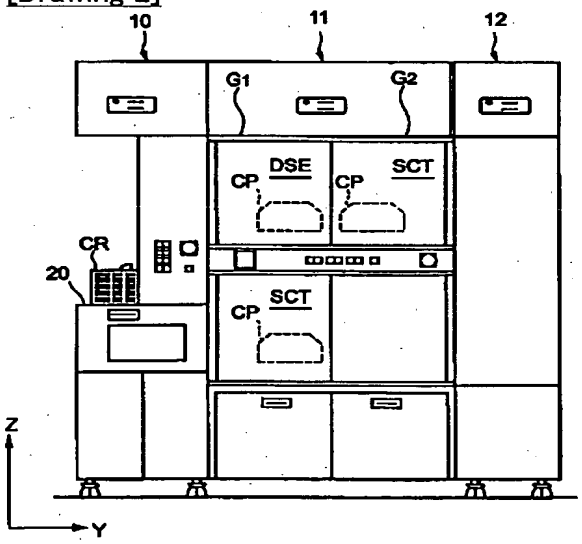
DRAWINGS

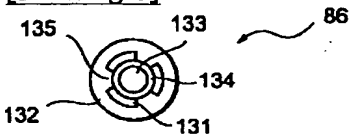
[Drawing 1]



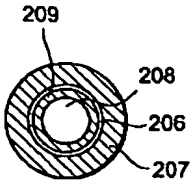
[Drawing 2]



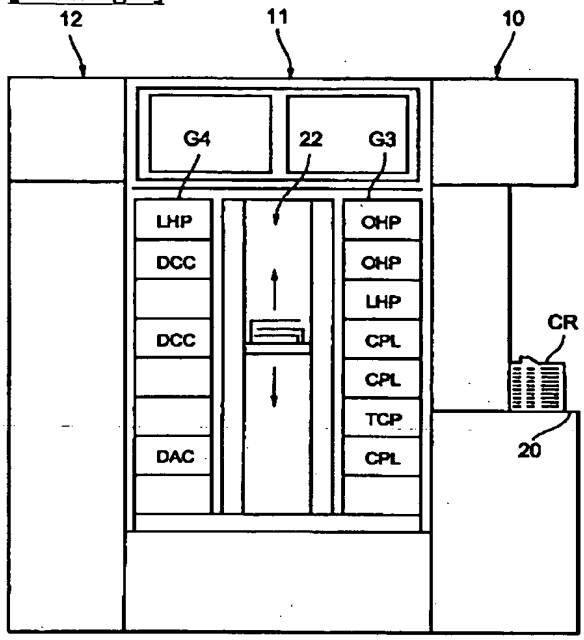
[Drawing 8]



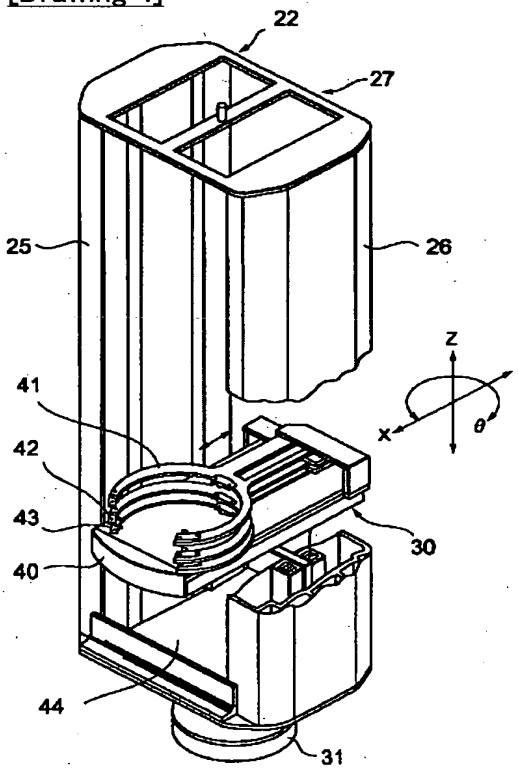
[Drawing 17]



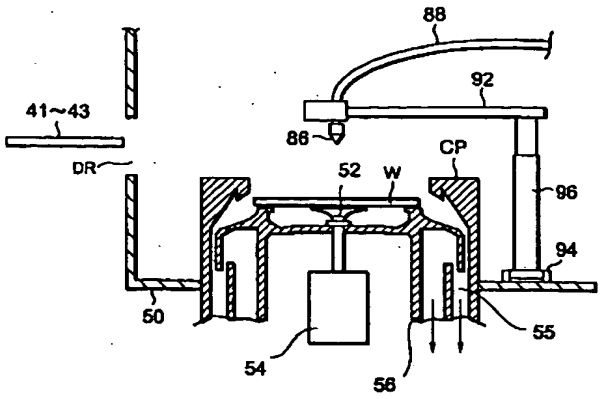
[Drawing 3]



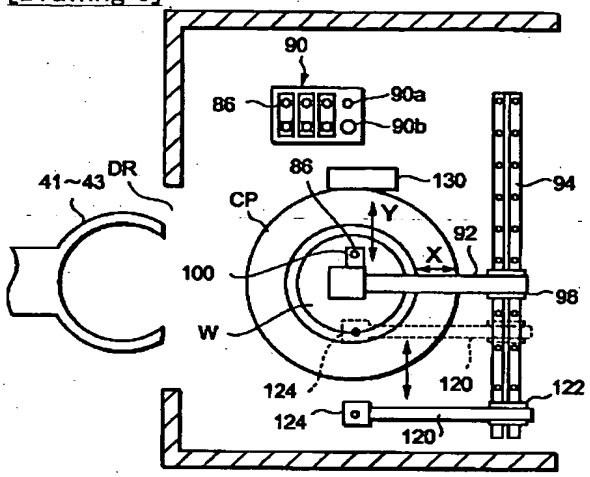
[Drawing 4]



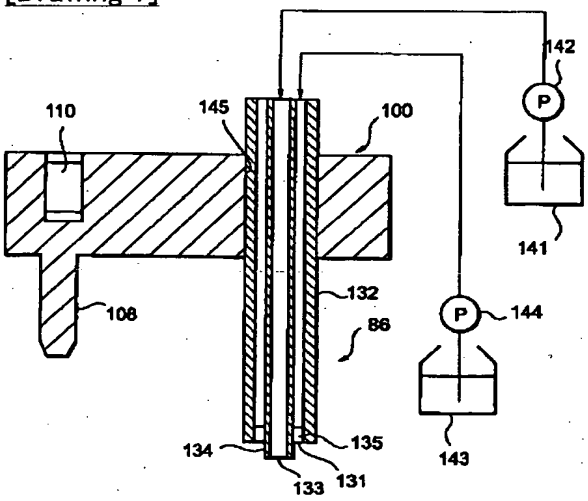
[Drawing 5]



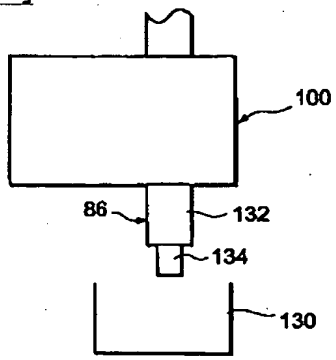
[Drawing 6]



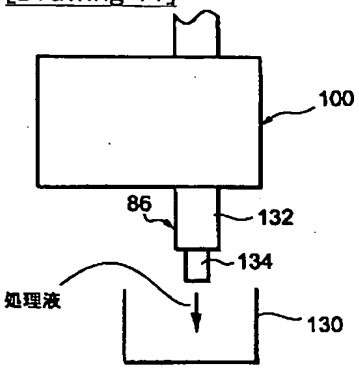
[Drawing 7]



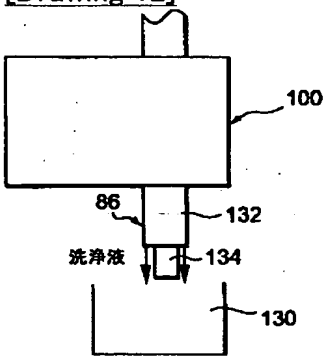
[Drawing 10]



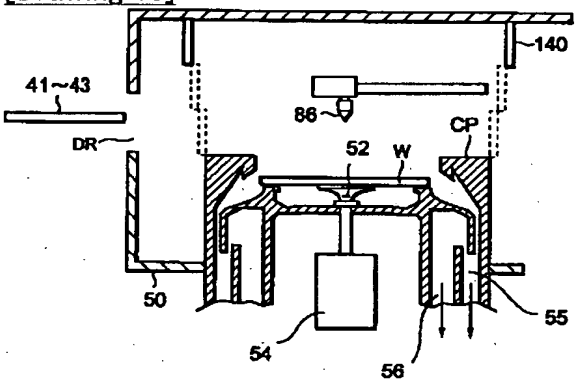
[Drawing 11]



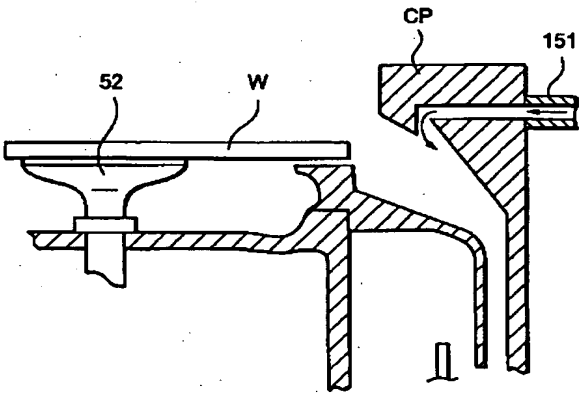
[Drawing 12]



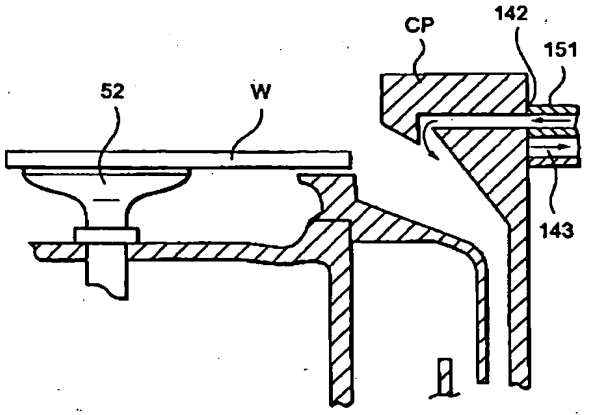
[Drawing 13]



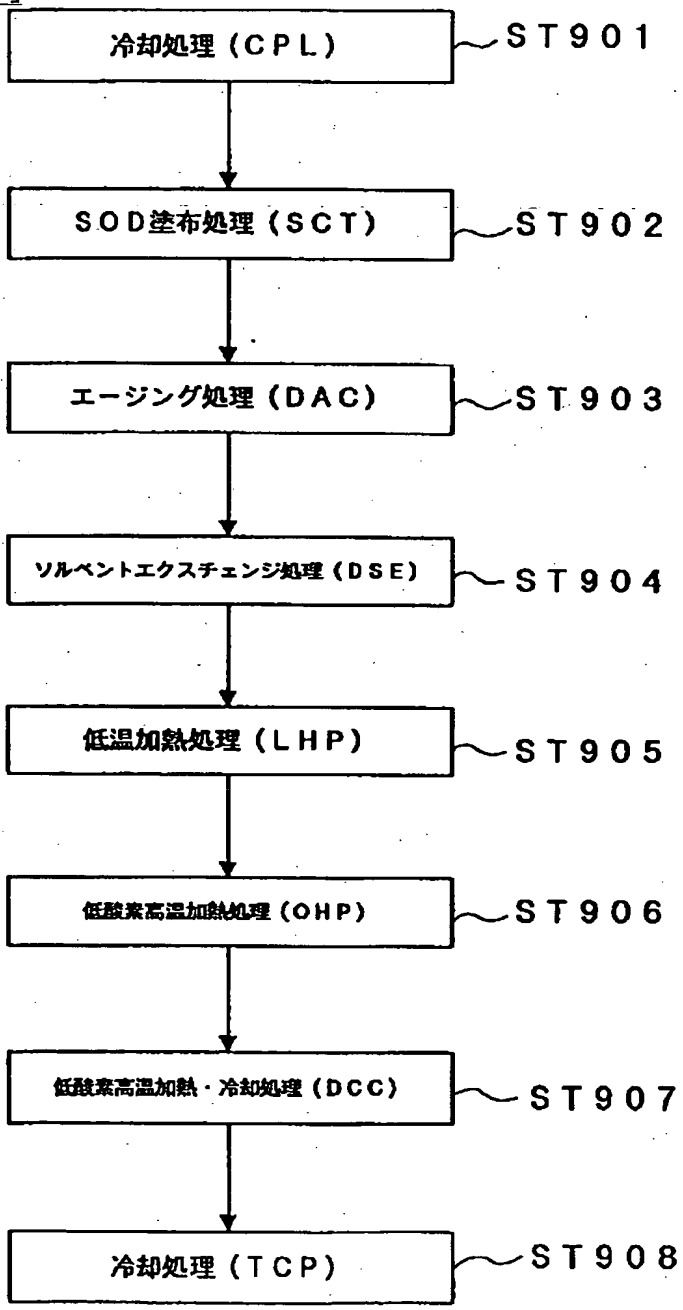
[Drawing 14]



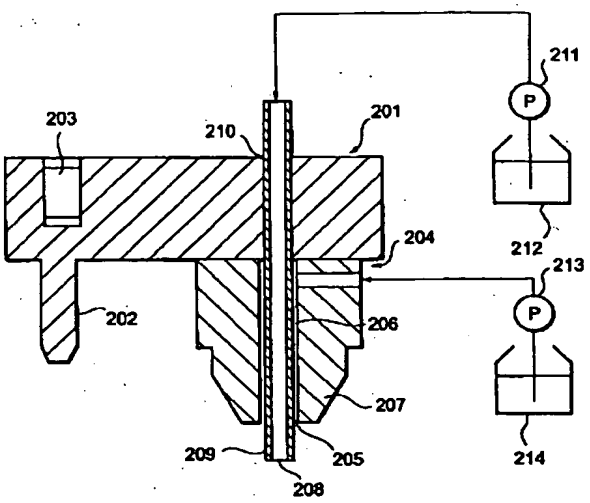
[Drawing 15]



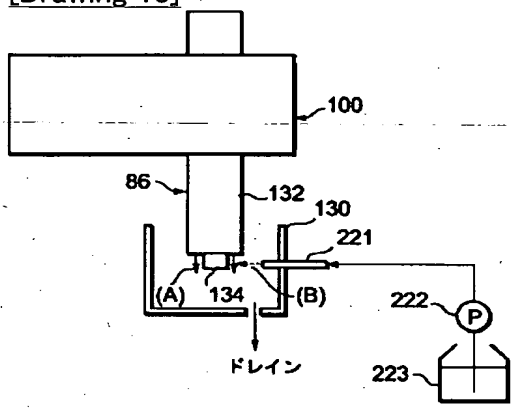
[Drawing 9]



[Drawing 16]



[Drawing 18]



[Translation done.]